SAT_O Glossary (Independent Formalization)

Abstract

This document provides an independent glossary of terms and symbols used in the SAT_O framework. It supersedes prior project glossaries and maintains strict one-symbol-one-meaning conventions under principles of minimal assumption.

Glossary

Symbol / Term	Definition
M	4D smooth differentiable manifold; no prior metric, connection, or gauge fields assumed.
$\gamma : \mathbb{R} \to M$	Worldline (filament); smooth, parameterized by affine parameter λ.
$v^\mu = \frac{dx^\mu}{d\lambda}$	Tangent vector to the filament.
$\tau_\mu(x)$	Emergent time 1-form derived from filament current $J^\mu(x)$.
$\phi(x)$	Emergent time foliation scalar field satisfying $d\phi = \tau$.
$\tilde{g}^{\mu\nu}(x)$	Emergent co-metric from filament velocity ensemble average $\langle v^\mu v^\nu \rangle$.
$g_{\mu\nu}(x)$	Emergent metric (inverse of $\tilde{g}^{\mu\nu}$).
S_{filament}	Filament action; proportional to integral of worldline length.
S_{gravity}	Emergent gravitational action; Einstein-Hilbert term induced via filament ensemble.
Λ_{induced}	Emergent cosmological constant from filament vacuum energy.
$\mathcal{L}_\mu(x)$	Emergent gauge potential from local linking/twisting density.
$F_{\mu\nu}$	Emergent gauge field strength tensor derived from $\mathcal{L}_\mu$.
g_G	Emergent gauge coupling constant; inversely related to filament linking density.
ℓ_f	Filament transverse scale $\ell_f = (2A/T)^{1/3}$, from tension T and rigidity A.
ρ_{link}	Filament linking density (links per unit volume).
ρ_{winding}	Filament winding density (loops per unit volume).
$\rho_{\text{triple link}}$	Filament triple linking density (Borromean triples per unit volume).
G_{induced}	Emergent Newton constant from filament ensemble statistical behavior.
$\hbar_{\text{eff}}$	Emergent Planck constant from filament transverse scale and tension.
$\mathcal{H}$	Hamiltonian for filament perturbations.
$\psi(x)$	Hypothetical emergent matter field (fermion candidate, under investigation).
$\xi^\mu(\lambda)$	Perturbations transverse to filament worldlines.

$\pi_\mu(\lambda)$	Canonical momentum conjugate to $\xi^\mu(\lambda)$.

Policy Directive

- **Do not use** SAT20 Glossary (uploaded Project Files) for current SAT_O work.
- **Use this** SAT_O Glossary — all symbol definitions are formalized independently.
- **SAT_O Glossary Supersedes** prior definitions.

Glossary Notes

- **One Symbol, One Meaning** enforced.
- **Minimal Assumption** construction only — no prior geometrical structures unless emergent.
- **Falsifiability Criteria**: Each symbol linked to empirical predictions or logical tests.